

THE  
PROCEEDINGS  
OF  
THE PHYSICAL SOCIETY

Section B

FROM JANUARY 1953 TO DECEMBER 1953

VOLUME 66



Published by  
THE PHYSICAL SOCIETY  
1 Lowther Gardens, Prince Consort Road,  
London S.W.7

## OFFICERS AND COUNCIL, 1953-54

### PRESIDENT

R. WHIDDINGTON, C.B.E., M.A., D.Sc., F.R.S.

### VICE-PRESIDENTS

#### who have filled the Office of President

- Sir FRANK SMITH, G.C.B., G.B.E., D.Sc., LL.D., F.R.S. (1924-26)  
Sir OWEN RICHARDSON, M.A., D.Sc., F.R.S. (1926-28)  
W. H. ECCLES, D.Sc., M.I.E.E., F.R.S. (1928-30)  
A. O. RANKINE, O.B.E., D.Sc., F.R.S. (1932-34)  
T. SMITH, M.A., F.R.S. (1936-38)  
Sir CHARLES DARWIN, K.B.E., M.C., M.A., Sc.D., F.R.S. (1941-43)  
E. N. DA C. ANDRADE, Ph.D., D.Sc., F.R.S. (1943-45)  
Sir DAVID BRUNT, M.A., Sc.D., F.R.S. (1945-47)  
G. I. FINCH, M.B.E., D.Sc., F.R.S. (1947-49)  
S. CHAPMAN, M.A., D.Sc., F.R.S. (1949-50)  
L. F. BATES, D.Sc., Ph.D., F.R.S. (1950-52)

### VICE-PRESIDENTS

- A. C. G. MENZIES, M.A., D.Sc.                    R. C. EVANS, M.A., Ph.D.  
J. H. AWBERY, M.A., B.Sc.                    A. B. WOOD, O.B.E., D.Sc.

### HONORARY SECRETARIES

- C. G. WYNNE, B.A., Ph.D. (*Business*)            H. H. HOPKINS, D.Sc. (*Papers*)

### HONORARY FOREIGN SECRETARY

- E. N. DA C. ANDRADE, Ph.D., D.Sc., F.R.S.

### HONORARY TREASURER

- A. J. PHILPOT, C.B.E., M.A., B.Sc.

### HONORARY LIBRARIAN

- R. W. B. PEARSE, D.Sc., Ph.D.

### ORDINARY MEMBERS OF COUNCIL

- |  |                                     |
|--|-------------------------------------|
| H. S. W. MASSEY, B.A., Ph.D., F.R.S.   | S. DEVONS, M.A., Ph.D.              |
| R. W. B. STEPHENS, D.Sc., Ph.D.        | F. LLEWELLYN JONES, M.A., D.Phil.   |
| S. MARSH, D.Sc., Ph.D.                 | R. W. DITCHBURN, M.A., B.Sc., Ph.D. |
| A. E. DE BARR, B.Sc.                   | H. G. KUHN, M.A., Dr.Phil.          |
| P. M. S. BLACKETT, M.A., D.Sc., F.R.S. | A. G. PEACOCK, B.Sc.                |
| N. FEATHER, B.A., Ph.D., B.Sc., F.R.S. | D. W. FRY, M.Sc.                    |

---

### COLOUR GROUP

#### Chairman

L. C. THOMSON, M.B., B.S., Ph.D.

#### Honorary Secretary

R. W. G. HUNT, B.Sc., Ph.D.

### OPTICAL GROUP

#### Chairman

J. GUILD, A.R.C.S., D.I.C.

#### Honorary Secretary

K. J. HABELL, M.Sc.

---

### LOW-TEMPERATURE GROUP

#### Chairman

D. M. NEWITT, D.Sc., F.R.S.

#### Honorary Secretary

F. DIN, B.Sc., Ph.D.

---

### ACOUSTICS GROUP

#### Chairman

W. WEST, B.A., M.I.E.E.

#### Joint Honorary Secretaries

W. A. ALLEN, B.Arch., A.R.I.B.A.  
R. W. B. STEPHENS, D.Sc., Ph.D.

---

### SECRETARY-EDITOR

Miss A. C. STICKLAND, M.Sc., Ph.D.

1 Lowther Gardens, Prince Consort Road, London S.W.7

(Telephone : KENsington 0048)

# CONTENTS

*Part 1. January 1953.*

	PAGE
Editorial . . . . .	1
Mr. A. N. STROH. The Mean Shear Stress in an Array of Dislocations and Latent Hardening . . . . .	2
Dr. DOROTHY FISHER. Crystal Structures of Gutta Percha . . . . .	7
Prof. F. LLEWELLYN JONES and Dr. G. C. WILLIAMS. Collisional Processes and Similarity in High-Frequency Discharges in Helium . . . . .	17
Dr. K. J. LE COUTEUR. Perturbations in the Magnetic Deflector for Synchro-Cyclotrons . . . . .	25
Mr. L. W. DAVIES. Spectroscopic Study of Caesium Discharges in a Magnetic Field . . . . .	33
Dr. C. HENDERSON, Mr. F. F. HEYMANN and Dr. R. E. JENNINGS. Phase Stability of the Mictrotron . . . . .	41
Dr. P. C. BANBURY. Carrier Injection and Extraction in Lead Sulphide . . . . .	50
Mr. G. LINDSTRÖM, Dr. K. SIEGBAHN and Mr. A. H. WAPSTRA. A Precision Measurement of the $^{137}\text{Cs}$ $\gamma$ -Line . . . . .	54
Letters to the Editor :	
Mr. J. J. DOWD and Mr. R. L. ROUSE. Distribution Coefficient of Indium in Germanium on Crystallization . . . . .	60
Reviews of Books . . . . .	61
Corrigenda (CLEGG and TAYLOR, CLEGG) . . . . .	63
Contents of Section A . . . . .	64

*Part 2. February 1953.*

Dr. A. J. GOSS. The Effect of Added Metallic Impurity and of Closed Moulds on the Growth from the Melt of Single Crystals of Tin . . . . .	65
Mr. J. H. CALDERWOOD and Dr. R. COOPER. Variation of the Electric Strength of KCl and NaCl Crystals with Temperature . . . . .	74
Prof. J. B. BIRKS and Mr. J. W. KING. The Luminescence of Air, Glass and Quartz under $\alpha$ -Particle Irradiation . . . . .	81
Dr. D. W. GOODWIN and Mr. K. A. MACFADYEN. Electrical Conduction and Breakdown in Liquid Dielectrics . . . . .	85
Dr. J. H. PIDDINGTON. Thermal Theories of the High-Intensity Components of Solar Radio-Frequency Radiation . . . . .	97
Mr. R. B. BANERJI. Some Studies on Random Fading Characteristics . . . . .	105
Dr. S. THORNTON. The Measurement of the Absolute Viscosity of Anomalous Fluids—I: The Measurement of the Time-dependence of Viscosity of Thixotropic Materials . . . . .	115
Dr. S. THORNTON and Dr. D. D. RAE. The Measurement of the Absolute Viscosity of Anomalous Fluids—II: A Comparison of Absolute Viscosity Measurements on Instantaneously Thixotropic Fluids . . . . .	120
Dr. H. R. THIRSK. The Structure and Orientation of Calomel formed on Liquid Mercury by Anodic Polarization . . . . .	129
Dr. D. G. AVERY. The Optical Constants of Lead Sulphide, Lead Selenide and Lead Telluride in the $0.5\text{--}3\mu$ Region of the Spectrum . . . . .	134
Dr. T. S. MOSS. Inter-Relation between Optical Constants for Lead Telluride and Silicon . . . . .	141
Dr. E. H. LINFOOT and Dr. E. WOLF. Diffraction Images in Systems with an Annular Aperture . . . . .	145
Letters to the Editor :	
Dr. T. R. KAISER and Dr. J. S. GREENHOW. On the Decay of Radio Echoes from Meteor Trails . . . . .	150
Book Notices . . . . .	151
Contents of Section A . . . . .	152

*Contents**Part 3. March 1953.*

	PAGE
Mr. L. GRUNBERG. The Formation of Hydrogen Peroxide on Fresh Metal Surfaces	153
Dr. B. V. ROLLIN and Mr. E. L. SIMMONS. Long Wavelength Infra Red Photoconductivity of Silicon at Low Temperatures	162
Dr. K. S. W. CHAMPION. The Energy Balance Equation for the Positive Columns of High Pressure Arcs	169
Dr. V. I. LITTLE. A Standard Wave Method for Measuring Electromagnetic Absorption in Polar Liquids at Frequencies of the order $3 \times 10^9$ c/s	175
Dr. V. I. LITTLE. An Analogue Computer employing the Principle of the Kelvin Bridge	185
Dr. L. ESSEN. The Refractive Indices of Water Vapour, Air, Oxygen, Nitrogen, Hydrogen, Deuterium and Helium	189
Dr. W. PAUL and Prof. R. V. JONES. Absorption Spectra of Lead Sulphide at Different Temperatures	194
Dr. H. CRAIG and Dr. C. F. DIETRICH. Development of a New Method for the Absolute Determination of $\beta$ -Ray Energies	201
Dr. C. A. HOGARTH. Transistor Action and Related Phenomena in Lead Sulphide Specimens from Various Sources	216
Dr. R. J. WAKELIN and Dr. E. L. YATES. A Study of the Order-Disorder Transformation in Iron-Nickel Alloys in the Region $\text{FeNi}_3$	221
Mr. R. G. WYLIE. The Freezing of Supercooled Water in Glass	241
Letters to the Editor :	
Dr. G. O. JONES and Mr. F. D. STACEY. The Saturation Magnetization of Nickel at High Pressure	255
Dr. H. J. ARNIKAR. The 'Corona Pressure' and Negative Joshi Effect	256
Dr. K. E. SPELLS. Sensitive Bubble Jets	258
Dr. B. V. ROLLIN and Mr. I. M. TEMPLETON. Noise in Semiconductors at Very Low Frequencies	259
Reviews of Books	261
Contents of Section A	264

*Part 4. April 1953.*

Mr. W. P. OSMOND. An Interpretation of the Magnetic Properties of some Iron-Oxide Powders : II	265
Dr. R. W. WRIGHT. Low Temperature Conduction in Extremely Degenerate Semiconductors	273
Mr. A. LEMPICKI. The Origin of Secondary Emission Electrons	278
Mr. A. LEMPICKI. The Electrical Conductivity of $\text{MgO}$ Single Crystals at High Temperatures	281
Dr. W. W. H. CLARKE and Dr. L. JACOB. Some Characteristics of a Low Voltage Electron Immersion Objective	284
Mr. P. F. CHESTER and Dr. G. O. JONES. A Miniature Helium Liquefier-Cryostat of Cascade Type	296
Mr. B. W. MOTT and Mr. H. R. HAINES. The Effect of Strain in Objective Lenses used for Microscopical Examination of Metals under Polarized Light	302
Mr. R. P. WALDO LEWIS. The Reflection of Radio Waves from an Ionized Layer having both Vertical and Horizontal Ionization Gradients	308
Dr. A. CHARLESBY. Ionic Current and Film Growth of Thin Oxide Layers on Aluminium	317
Research Notes :	
Mr. J. B. GUNN. Radiative Transitions in Germanium	330
Dr. H. H. HOPKINS. A Note on the Theory of Phase-Contrast Images	331
Letters to the Editor :	
Mr. R. E. BURGESS. Contact Noise in Semiconductors	334
Reviews of Books	335
Contents of Section A	344

## Contents

v

### Part 5. May 1953.

	PAGE
Prof. F. LLEWELLYN JONES and Dr. G. C. WILLIAMS. The Electrical Breakdown of Gases in Non-Uniform Fields at Low Pressure . . . . .	345
Dr. H. R. HEATH. The Viscosity of Gas Mixtures . . . . .	362
Dr. S. PARTHASARATHY and Mr. N. N. BAKHSHI. Relation between Velocity of Sound and Viscosity in Liquids . . . . .	368
Prof. H. N. BOSE and Mr. J. SHARMA. Decay of Long Period Afterglow of Alkali Halides under Cathode Ray Excitation . . . . .	371
Dr. R. MANSFIELD and Mr. S. A. SALAM. Electrical Properties of Molybdenite . . . . .	377
Dr. A. SCHALLAMACH. The Velocity and Temperature Dependence of Rubber Friction . . . . .	386
Dr. HUNTER ROUSE, Dr. W. D. BAINES and Mr. H. W. HUMPHREYS. Free Convection over Parallel Sources of Heat . . . . .	393
Dr. S. WAGENER. Sorption of Gases at Very Low Pressures by Thorium Powder . . . . .	400
Dr. AJIT RAM VERMA and Miss P. M. REYNOLDS. Interferometric Studies of the Growth of Stearic Acid Crystals and their Optical Properties . . . . .	414
Research Notes :	
Mr. M. O. BRYANT and Dr. G. O. JONES. Direct Measurement of the Specific Heat at Constant Volume of Pentane and Alcohol . . . . .	421
Dr. P. A. LINDSAY and Mr. G. D. SIMS. Application of the Thermodynamics of Irreversible Processes to the Theory of the Magnetron . . . . .	423
Dr. T. J. LEWIS. The Dependence of the Dielectric Strength of Pure Liquids on Cathode Material . . . . .	425
Letters to the Editor :	
Dr. J. W. GRANVILLE and Dr. W. BARDSLEY. Some Properties of Silicon Point-Contact Transistors . . . . .	429
Mr. R. E. BURGESS. The Influence of Mobility Variation in High Fields on the Diffusion Theory of Rectifier Barriers . . . . .	430
Mr. O. P. DOGRA, Mr. M. G. BHATAWDEKAR and Mr. N. A. RAMAIAH. A Note on Secondary Processes in a Low-Frequency Electrodeless Discharge . . . . .	431
Reviews of Books . . . . .	433
Contents of Section A . . . . .	440

### Part 6. June 1953.

Mr. T. MULVEY. The Magnetic Circuit in Electron Microscope Lenses . . . . .	441
Dr. G. LIEBMANN. The Effect of Pole Piece Saturation in Magnetic Electron Lenses . . . . .	448
Dr. O. H. WYATT. Transient Creep in Pure Metals . . . . .	459
Dr. N. THOMPSON. Dislocation Nodes in Face-Centred Cubic Lattices . . . . .	481
Dr. H. P. MYERS. A Simple Varying Capacitor Method for the Measurement of Contact Potential Difference in High Vacuum . . . . .	493
Mr. R. D. CRAIG and Dr. J. D. CRAGGS. Some Properties of Hydrogen Spark Channels . . . . .	500
Letters to the Editor :	
Dr. D. G. AVERY and Dr. P. L. CLEGG. The Optical Constants of a Single Crystal of Germanium . . . . .	512
Dr. K. N. OGLE; Prof. W. D. WRIGHT. The Role of Convergence in Stereoscopic Vision . . . . .	513
Dr. H. L. WAIN and Mr. F. HENDERSON. Room Temperature Brittleness of Chromium . . . . .	515
Reviews of Books . . . . .	517
Corrigendum (VERMA and REYNOLDS) . . . . .	523
Contents of Section A . . . . .	524

*Contents**Part 7. July 1953.*

	PAGE
Dr. A. J. GOSS. Heat Flow and the Growth of Metal Single Crystals from the Melt	525
Dr. A. CHARLESBY. Electron Currents in Thin Oxide Films on Aluminium	533
Dr. K. M. POOLE. Electrode Contamination in Electron Optical Systems	542
Dr. P. W. TREZONA. Additivity of Colour Equations	548
Dr. R. CADE. Some Electrostatic and Steady-Current Problems Involving Anisotropic Bodies	557
Miss A. D. STUCKES. Electro-Thermal Behaviour of Point Contacts to Semiconductors	570
Dr. A. F. GIBSON. Injected Absorption in Germanium	588
Dr. W. CULSHAW. The Fabry-Perot Interferometer at Millimetre Wavelengths	597
Research Notes :	
Prof. L. F. BATES and Mr. N. P. R. SHERRY. Thermal Effects accompanying Magnetization of a Ferrimagnetic Material	609
Letters to the Editor :	
Mr. S. H. M. EL-SABEH and Dr. J. B. HASTED. The Dielectric Constant of a Liquid containing Spherical Particles	611
Dr. R. MANSFIELD. The Electrical Conductivity and Thermoelectric Power of Magnesium Oxide	612
Mr. J. W. BREMNER. The Variation of Transverse Viscosity with Shear Rate	614
Reviews of Books	615
Contents for Section A	616

*Part 8. August 1953.*

Mr. J. E. H. BRAYBON. The Mechanism of Stress Birefringence in Amorphous Solids	617
Mr. J. LEES. Cuprous Oxide Rectifier Characteristics	622
Dr. R. S. TEBBLE and Dr. V. L. NEWHOUSE. The Barkhausen Effect in Single Crystals	633
Dr. O. M. WHITE. Oscillations in Space Charge Detectors and the Ultra-Ionization Potentials of Mercury	642
Dr. N. FUSCHILLO. Thermoelectric Effects due to Stationary and Moving Asymmetrical Temperature Gradients in Mercury	649
Dr. C. HENDERSON, Mr. F. F. HEYMANN and Dr. R. E. JENNINGS. The Design and Operation of a 4.5 Mev Microtron	654
Dr. C. GREY MORGAN and Mr. D. HARCOMBE. Fundamental Processes of the Initiation of Electrical Discharges	665
Mr. I. M. TEMPLETON and Dr. D. K. C. MACDONALD. The Electrical Conductivity and Current Noise of Carbon Resistors	680
Mr. E. K. BIGG. The Supercooling of Water	688
Mr. D. E. WESTON. The Theory of the Propagation of Plane Sound Waves in Tubes	695
Research Notes :	
Prof. S. CHAPMAN. Note on the Grazing-Incidence Integral $Ch(x, \chi)$ for Monochromatic Absorption in an Exponential Atmosphere	710
Mr. D. H. MARTIN. Ferromagnetic Domain Processes in Single Crystal Disc Specimens of Silicon Iron	712
Letters to the Editor :	
Dr. D. A. BELL. Johnson Noise and Equipartition	714
Dr. R. COOPER and Mr. D. T. GROSSART. The Influence of Cathode Material on the Electric Strength of Potassium Bromide Crystals	716
Mr. R. P. AGARWALA and Dr. H. WILMAN. The Surface Deformation caused on Iron Crystals by Unidirectional Abrasion	717
Book Notices	719
Contents of Section A	720

## Part 9. September 1953.

	PAGE
Dr. D. F. DENNY. The Influence of Load and Surface Roughness on the Friction of Rubber-Like Materials . . . . .	721
Dr. R. F. KING and Dr. D. TABOR. The Effect of Temperature on the Mechanical Properties and the Friction of Plastics . . . . .	728
Dr. K. LANDECKER and Mr. B. J. ROBINSON. Study of High-Frequency Fluctuations from Light Sources using Phototubes and Tuned Radio-Frequency Amplifiers . . . . .	737
Dr. T. S. MOSS, Dr. L. PINCHERLE and Mrs. A. M. WOODWARD. Photoelectromagnetic and Photodiffusion Effects in Germanium . . . . .	743
Prof. K. ALEXOPOULOS and Dr. A. THEODOSSIου. On the Nature of Ferromagnetism in Pyrrhotite. . . . .	753
Dr. D. E. CARO and Prof. L. H. MARTIN. The Velocity of Sound in Air at Low Pressures . . . . .	760
Mr. D. E. WESTON and Mr. I. D. CAMPBELL. Experiments on the Propagation of Plane Sound Waves in Tubes—I : The Adiabatic Region, by D. E. WESTON. II : The Transition Region, by D. E. WESTON and I. D. CAMPBELL . . . . .	769
Dr. J. C. BURFOOT. Correction of Electrostatic Lenses by Departure from Rotational Symmetry . . . . .	775
Dr. A. K. HEAD. Edge Dislocations in Inhomogeneous Media . . . . .	793
Research Notes :	
Mr. J. S. BELL. Vertical Focusing in the Microtron . . . . .	802
Mr. A. W. SIMPSON and Mr. R. H. TREDGOLD. Magnetic Viscosity in Platinum Cobalt . . . . .	805
Letters to the Editor :	
Mr. T. F. JOHNS. Vapour Pressure Ratio of $^{12}\text{C}^{16}\text{O}$ and $^{13}\text{C}^{16}\text{O}$ . . . . .	808
Reviews of Books . . . . .	810
Corrigendum (GOODWIN and MACFADYEN) . . . . .	815
Contents of Section A . . . . .	816

## Part 10. October 1953.

Dr. A. SCHALLAMACH. Surface Condition and Electrical Impedance in Rubber Friction . . . . .	817
Mr. P. M. TIPPLE and Dr. H. K. HENISCH. Thermal Effects at Point Contact Diodes . . . . .	826
Dr. P. C. BANBURY. Theory of the Forward Characteristic of Injecting Point Contacts . . . . .	833
Dr. H. K. HENISCH and Mr. F. D. MORTEN. Forward Characteristic of Injecting Area Contacts on Germanium . . . . .	841
Dr. C. A. HOGARTH. A Study of Carrier Injecting Properties of Emitter Contacts and Light Spots at Normal and Moderately Elevated Temperatures . . . . .	845
Dr. W. CULSHAW and Mr. D. S. JONES. Effect of a Metal Plate on Total Reflection . . . . .	859
Dr. P. FELTHAM. The Plastic Flow of Iron and Plain Carbon Steels above the $\text{A}_3$ -Point . . . . .	865
Miss S. M. CRAWFORD. The Relation between Stress, Strain and Birefringence in some High Polymers . . . . .	884
Dr. E. V. VERNON and Mr. S. WEINTROUB. The Measurement of the Thermal Expansion of Single Crystals of Indium and Tin with a Photoelectric Recording Dilatometer . . . . .	887
Research Notes :	
Mr. F. J. HEWITT. The Study of Lightning Streamers with 50 cm Radar . . . . .	895
Letters to the Editor :	
Dr. L. W. DAVIES. Spectroscopic Study of Caesium Discharges in a Magnetic Field . . . . .	898
Dr. W. N. REYNOLDS. Surface Recombination in Germanium . . . . .	899
Reviews of Books . . . . .	901
Contents of Section A . . . . .	904

*Part 11. November 1953.*

	PAGE
Dr. H. P. MURBACH and Dr. H. WILMAN. The Origin of Stress in Metal Layers Condensed from the Vapour in High Vacuum . . . . .	905
Dr. C. G. CAMPBELL and Mr. J. KYLES. The Variable-Radius Semicircular Magnetic Focusing $\beta$ -Ray Spectrometer . . . . .	911
Dr. J. M. DANIELS. The Design and Construction of a 1000 kw Water Cooled Solenoid intended for Experiments on Nuclear Alignment and Adiabatic Nuclear Demagnetization . . . . .	921
Dr. E. RABINOWICZ. A Quantitative Study of the Wear Process . . . . .	929
Mr. M. K. BANERJEE and Dr. A. K. SAHA. Investigations on a Short Magnetic Lens Spectrometer . . . . .	937
Prof. G. I. FINCH, Dr. H. C. LEWIS and Dr. D. P. D. WEBB. The Diffraction of 150 kv Electrons . . . . .	949
Miss S. M. CRAWFORD. An Optical Method of Observing Stress Relaxation in Transparent Solids . . . . .	954
Mr. J. C. BURRIDGE, Dr. H. KUHN and Lady ANNE PERY. Reflectivity of Thin Aluminium Films and their Use in Interferometry . . . . .	963
Dr. T. S. ROBINSON and Dr. W. C. PRICE. The Determination of Infra-Red Absorption Spectra from Reflection Measurements . . . . .	969
Mr. L. R. BAKER. The Effect of Source Size on the Coherence of an Illuminating Wave . . . . .	975
Research Notes :	
Dr. F. W. G. ROSE and Mr. E. W. TIMMINS. A Method of Estimating Impurity Concentrations in Germanium . . . . .	984
Mr. R. N. BRACEWELL. A Microwave Computing Problem . . . . .	987
Letters to the Editor :	
Dr. A. R. VERMA and Miss P. M. REYNOLDS. A Further Note upon the Growth and Optical Properties of Stearic Acid Crystals . . . . .	989
Reviews of Books . . . . .	990
Contents of Section A . . . . .	992

*Part 12. December 1953.*

Dr. T. S. MOSS. Photoelectromagnetic and Photoconductive Effects in Lead Sulphide Single Crystals . . . . .	993
Dr. A. R. LANG. Extinction in X-Ray Diffraction Patterns of Powders . . . . .	1003
Dr. U. W. ARNDT, Mr. W. A. COATES and Dr. D. P. RILEY. A Proportional-Counter Technique for Measuring X-Ray Scattering from Powders, Fibres and Liquids . . . . .	1009
Mr. F. J. HYDE. Measurements of Noise Spectra of a Point Contact Germanium Rectifier . . . . .	1017
Mr. T. L. ECKERSLEY. Recombination and Diffusion and Spread Echoes from the Ionosphere . . . . .	1025
Dr. A. POWELL. On the Mechanism of Choked Jet Noise . . . . .	1039
Dr. W. EHRENBERG and Dr. J. FRANKS. The Penetration of Electrons into Luminescent Material . . . . .	1057
Dr. G. N. LANCE and Dr. R. L. PERRY. Water Bells . . . . .	1067
Mr. D. A. WRIGHT and Dr. J. WOODS. The Decomposition of Thin Films on Bombardment with Slow Electrons . . . . .	1073
Dr. N. L. ALLEN. An Experiment on the Radial Motion of Charged Particles from a Pulsed Arc Discharge . . . . .	1087
Dr. J. M. COWLEY. A New Microscope Principle . . . . .	1096
Prof. J. REEKIE, Dr. T. S. HUTCHISON and Mr. F. E. HETHERINGTON. Precipitation Processes in Copper-Iron Alloys . . . . .	1101
Letters to the Editor :	
Dr. R. COOPER and Mr. A. A. WALLACE. Plastic Deformation and the Electric Strength of Alkali Halide Crystals . . . . .	1113

	PAGE
Dr. F. A. CUNNELL, Dr. E. W. SAKER and Mr. J. T. EDMOND. A Note on the Semiconducting Compound InSb . . . . .	1115
Mr. Y. KLINGER and Dr. E. W. SAKER. The Dielectric Constant of Amorphous Selenium at Wavelengths of 1 cm and 3 cm . . . . .	1117
Dr. J. W. GRANVILLE and Dr. A. F. GIBSON. The Reduction of Rectifier Noise by Illumination . . . . .	1118
Obituary Notices :	
WILLIAM DAMPIFR . . . . .	1120
ROBERT DONALDSON . . . . .	1121
LEONARD BELLINGHAM . . . . .	1122
EDWARD FELIX HERROUN . . . . .	1123
W. H. TOWNS . . . . .	1123
LEWIS FRY RICHARDSON . . . . .	1123
Reviews of Books . . . . .	1124
Contents of Section A . . . . .	1128
Subject Index, Section B, Vol. 66 . . . . .	1129
Index of Authors (with Titles), Section B, Vol. 66 . . . . .	1137
Index to Reviews of Books, Section B, Vol. 66 . . . . .	1143



# PROCEEDINGS AT THE MEETINGS OF THE PHYSICAL SOCIETY

## SESSION 1952-53

25th September 1952

The fifty-fifth meeting of THE OPTICAL GROUP was held at the Laboratories of the British Scientific Instrument Research Association, "Sira", Southill, Elmstead Woods, Chislehurst, Kent.

Brief descriptions were given of the work in progress of interest to the Group, followed by demonstrations.

---

3rd October 1952

*Extraordinary General Meeting*, in the Lecture Theatre of the Science Museum, Exhibition Road, London S.W.7. The President, Professor R. Whiddington, was in the Chair.

Changes in the Articles of Association were necessary to bring into effect the alteration in subscription arrangements agreed upon at the Annual General Meeting held on 20th May 1952. The proposed new Articles of Association which covered these alterations were still under consideration by the Board of Trade; it was, therefore, necessary to alter the existing Articles in order to bring the new scheme into force at the beginning of 1953. The necessary changes were therefore proposed and approved.

---

3rd October 1952

*Science Meeting*, in the Lecture Theatre of the Science Museum, Exhibition Road, London S.W.7. The President, Professor R. Whiddington, was in the Chair.

It was announced that Council had elected the following to Student Membership : Robert Ritchie Gardner, David John Gibbons, Michael Ison Large, John Harold Morgan, Keith Morgan, Neil Anthony Porter, Robert George Ridley, Brian Booth Smith, Cecil Jacob Waddington.

The following were elected to Fellowship, the first named being transferred from Student Membership : Aaron Klug, Raymond McKennel, C. S. Rao, Robert Richmond, David Robert Scott.

The 6th (1952) Rutherford Lecture was delivered by Professor R. E. Peierls and his subject was : The atomic nucleus and its constituents.

---

13th October 1952

The forty-sixth meeting of THE ACOUSTICS GROUP in the Lecture Theatre of the Science Museum, Exhibition Road, London S.W.7. Mr. W. West was in the Chair.

A lecture was given by Mr. A. T. Pickles on 'Acoustics in America'.

---

15th October 1952

The sixty-eighth meeting of THE COLOUR GROUP in the Lecture Theatre of the Institute of Ophthalmology, Judd Street, London W.C.1. Dr. T. Vickerstaff was in the Chair.

The following papers were read : Central foveal colour vision, by Dr. E. N. Willmer; Colour vision in extrafoveal regions, by Mr. R. A. Weale.

16th October 1952

*The forty-first meeting of THE LOW TEMPERATURE GROUP in the Lecture Theatre of the Science Museum, Exhibition Road, London S.W.7. Professor D. M. Newitt was in the Chair.*

A lecture entitled Gas compressors was given by Dr. A. J. Barnard.

---

29th October 1952

*Science Meeting* was held in the Lecture Theatre of the Science Museum, Exhibition Road, London S.W.7. The President, Professor R. Whiddington, was in the Chair.

It was announced that Council had elected the following to Student Membership : Klaus Dieter Bowers, Margaret Grace Brackenbury, Edward Dempsey, Jerzy Adam Dobrowolski, Patrick Matthew Forsyth, Christopher Denis Green, John Roger Leech, Malcolm J. Mitchell, Frederick Richard Morgan, Angus Neaves, Kenneth Parker, William Robert Phillips, Archie Walter Ross, Asok Kumar Som, Donald George Stevenson, Jon Pyser Tilt, Brian Graham Wilson.

The following were elected to Fellowship, the first named being transferred from Student Membership : Frank Patrick Chappel; John Kingsman Beling, Charles John Birkett Clews, Roy Claud Faust, John Walter Faure Juritz, Carl Einar Lindholm, Henry Miles O'Bryan, Shival Yogi Tiwari, Paul Thistleton.

A lecture was given by Professor M. T. F. von Laue on : Stehende Wellen im Raumgitter der Kristalle und ihr experimenteller Nachweis.

---

6th November 1952

*The fifty-sixth meeting of THE OPTICAL GROUP at the National Physical Laboratory, Teddington, Middlesex. Dr. A. C. Menzies was in the Chair.*

The following papers were presented, with demonstrations : A precision spherometer, by Mr. J. W. Gates ; New developments in thin films techniques, by Mr. J. S. Preston ; Choice of wavelengths for refractometry, by Mr. N. J. Rumsey ; Optical ray tracing using the pilot model of the automatic computing engine, by Mr. G. G. Alway. Other calculating machines were also on show.

---

4th November 1952

*The forty-seventh meeting of THE ACOUSTICS GROUP at Imperial College, Imperial Institute Road, London S.W.7. Mr. W. West was in the Chair.*

The subject of the meeting was The threshold of hearing, and the following papers were presented : The normal threshold of hearing and other aspects of standardization in audiometry, by Mr. R. S. Dadson ; A summary of the determination of the normal threshold of hearing, by Mr. L. J. Wheeler.

---

5th-7th November 1952

THE LOW TEMPERATURE GROUP visited Holland for the purpose of inspecting low temperature plant and laboratories. The following places were visited : Kamerlingh Onnes Laboratory, Leiden ; Philips Works and Physics Laboratory, Eindhoven ; Dutch State Mines, Limburg.

---

19th November 1952

*The forty-eighth meeting of THE ACOUSTICS GROUP with the Education Group of the Institute of Physics, at the Institute of Physics, 47 Belgrave Square, London S.W.1. Mr. W. West was in the Chair.*

The subject of the meeting was the Teaching of acoustics, and speakers included Mr. E. Nightingale, Dr. E. G. Richardson, Dr. R. W. B. Stephens.

28th November 1952

*Science Meeting*, in the Lecture Theatre of the Science Museum, Exhibition Road, London S.W.7. The President, Professor R. Whiddington, was in the Chair.

It was announced that Council had elected the following to Student Membership : Klaus Dieter Bowers, Edward Dempsey, Christopher Denis Green, John Roger Leech, Malcolm J. Mitchell, Frederick Richard Morgan, Angus Neaves, Kenneth Parker, Archie Walter Ross, Asok Kumar Sora, Jon Pyser Tilt, Brian Graham Wilson.

The following were elected to Fellowship, the first named being transferred from Student Membership : Reginald George Harlow; Christian Henry Copley, Kathleen Lonsdale, Chandra Bhan Sharma, Tor Heuch Tønnesen.

The 29th (1952) Duddell Medal was presented to Mr. C. Waller, who afterwards gave an account of his work entitled : Some topics concerning the production and application of nuclear emulsions.

The 8th (1952) Charles Vernon Boys Prize was presented to Dr. B. Bleaney who afterwards gave a short account of his work on Paramagnetic resonance at low temperatures.

---

3rd December 1952

*The sixty-ninth meeting of THE COLOUR GROUP* at the Lightning Service Bureau, 2 Savoy Hill, London W.C.2. Dr. W. S. Stiles was in the Chair.

The following paper was read : The architectural use of colour in schools, by Mr. Oliver Cox, Architect to the London County Council.

---

4th December 1952

*The forty-second meeting of THE LOW TEMPERATURE GROUP* in the Lecture Theatre of the Science Museum, Exhibition Road, London S.W.7. Professor D. M. Newitt was in the Chair.

A lecture entitled Has low temperature physics any practical applications? was given by Professor F. E. Simon.

---

4th December 1952

*The seventh Annual General Meeting of THE LOW TEMPERATURE GROUP* in the Lecture Theatre of the Science Museum, Exhibition Road, London S.W.7. Professor D. M. Newitt was in the Chair.

The Minutes of the sixth Annual General Meeting were read and confirmed.

The Report of the Committee for 1951-52 was presented.

The Officers and Council for 1952-53 were elected.

A vote of thanks was accorded to the retiring Committee Members.

---

8th December 1952

*The forty-ninth meeting of THE ACOUSTICS GROUP* in the Science Museum, Exhibition Road, London S.W.7. Mr. W. West was in the Chair.

The following paper was read : Measurement of elastic constants of solids, by Mr. G. Bradfield.

---

11th December 1952

*The fifty-seventh meeting of THE OPTICAL GROUP* in the Physics Department of Imperial College, London S.W.7. Dr. A. C. Menzies was in the Chair.

The following papers were read and discussed : Phase contrast images, by Dr. H. H. Hopkins; A wave-shearing interferometer for testing microscope objectives, by Mr. F. H. Smith; Wave-shearing interferometers with fixed amounts of shear, by Mr. D. Brown. Demonstrations were included with the two latter papers.

18–19th December 1952

*The Autumn Provincial Meeting* was held in the Physical Laboratories, Manchester University. The President, Professor R. Whiddington, was in the Chair. The Meeting was on the following subject : Ionization Loss by Relativistic Particles.

The following papers were read and discussed : Introduction, by J. G. Wilson; Ionization loss by  $\mu$ -mesons in oxygen; Counter and ionization chamber measurement of the most probable ionization of relativistic particles, by B. T. Price; Average energy expenditure per ion pair in gases, by J. M. Valentine; The grain-density of relativistic particles in photographic plates, by D. H. Perkins; Scintillation experiments on ionization loss in dense media, by B. D. Hyams and M. G. Mylroie; Theory of ionization loss, by M. Schonberg and G. Fowler.

---

7th January 1953

*The seventieth Science Meeting of THE COLOUR GROUP* was held at Imperial College, South Kensington, London S.W.7. Dr. T. Vickerstaff was in the Chair.

The following papers were read : A new visual colorimeter, by Prof. H. Cotton ; A visula tricolorimeter using the C.I.E. primaries X, Y and Z, by Mr. R. W. G. Hunt; The spectrophotometry of fluorescent pigments, by R. Donaldson.

---

14th January 1953

*The fiftieth meeting of THE ACOUSTICS GROUP* in the Physics Department of Imperial College, London S.W.7. Mr. W. West was in the Chair.

A talk entitled : Sound absorption in aqueous solutions of electrolytes was given by Dr. K. Tamm and Dr. G. Kurtze.

---

26th January 1953

*The fifty-first meeting of THE ACOUSTICS GROUP* in Room 4, University College, Malet Place, London W.C.1. Mr. W. West was in the Chair.

The following paper was read : An acoustical and mechanical impedance measuring set, and some results of measurements on human ears and mastoids, by E. Aspinall and J. Y. Morton.

---

6th February 1953

*Science Meeting*, in the Department of Meteorology, Imperial College, Exhibition Road, London S.W.7. Professor H. S. W. Massey was in the Chair for the Business session, and Mr. J. A. Ratcliffe was in the Chair during the reading of papers.

It was announced that Council had elected the following to Student Membership : Max Adler.

The following were elected to Fellowship, the first thirty being transferred from Student Membership :—James Roy Allen, Harry Bridge, Leonard Denis Brown, Clifford Harry Champness, Max Theodore Christensen, Norman David Cowell, Derek Ian Dawton, Peter Derek Edmonds, John Hollick Frisby, William Alexander Gambling, Bryan Leonard Hart, Graham Robertson Hercus, Charles Henric Johnson, Charles G. Kuper, Alan Bernard Lidiard, James Peter Marsden, Rama Chandra Murty, Uno Opik, Ralph Whaddon Parsons, Edwin Albert Power, George Thomas Pullman, John Samuel Pyett, Alistair Christopher Rose-Innes, Mohamed Salah Eldin Abdel Salam, Sunil Kumar Sen, Ernest Lewis Simmons, Kathleen Stratton, Leonard Kindell Street, Alan Teviotdale, Derek Ross Tibbets; Samuel Francis Boys, Charles Joseph Braudo, Margaretha Wilhelmina Bruin, David Edmund Caro, Alfred Hans von Engel, George Richard Evans, Syed Mujtaba Karim, Ernst Walter Kellermann, Gething Morgan Lewis, Hugh Christopher Longuet-Higgins, Augusta

Manfredini, Arthur Hamilton McIlraith, Benjamin Terance Price, Pamela Rothwell, Robert Arno Sack, John Ashley Spiers, L. C. Thomson, Vijaychandra Natwarlal Upadhyaya, Albert Meredith Morgan Voyce, Jan Jacobus Went, Erich Peter Wohlfarth, John Edwin Wood.

The following papers were read and discussed : General dynamical features of the upper atmosphere, by P. A. Sheppard ; Effects of topography on the flow atmosphere, by R. S. Scorer; Cosmic rays and state of the atmosphere, by E. P. George; Oscillation and storm phenomena in the ionosphere by W. R. Piggott.

---

17th February 1953

*The forty-third Science Meeting of THE LOW TEMPERATURE GROUP* was held, in conjunction with the Institute of Refrigeration, in the small Lecture Theatre of the Institution of Mechanical Engineers, Storey's Gate, Westminster, London S.W.1. Sir Charles Darwin was in the Chair.

The meeting took the form of a discussion on Novel refrigeration cycles, and the following speakers opened this discussion : Dr. P. F. Chester on Unattainable states in gas liquefaction, Dr. G. G. Haselden on Refrigeration cycles providing cooling over a temperature range, Mr. M. E. Anderson on Problems encountered in the design of plant for low refrigeration temperatures, Mr. A. G. Monroe on The Hilsch vortex cooler.

---

18th February 1953

*The seventy-first meeting of THE COLOUR GROUP* was held in the Lecture Theatre of the Institute of Ophthalmology, Judd Street, London W.C.1. Dr. W. S. Stiles was in the Chair.

The following papers were given : The convergence of the tritanopic confusion loci and the deviation of the fundamental response curves, by Dr. L. C. Thomson and Professor W. D. Wright; Some aspects of cone monochromatism, by Mr. R. A. Weale; Defective colour vision and human genetics, by Dr. H. Kalmus.

---

18th February 1953

*The fifty-second meeting of THE ACOUSTICS GROUP* in the Science Museum, Exhibition Road, London S.W.7. Mr. W. West was in the Chair.

Demonstrations of some old instruments—musical and otherwise—from the acoustics collection in the Science Museum were given by Dr. D. H. Follett.

---

13th March 1953

*Science Meeting of THE SOCIETY* in the Science Museum, Exhibition Road, London S.W.7. The President, Professor R. Whiddington, was in the Chair.

The following were elected to Fellowship, the first thirteen named being transferred from Student Membership :—Ronald Drayton Brown, Peter James Campion, Kathleen Marjorie Gratwick, Dorothy Joyce Harrington, Richard Charles Holloway, John Arthur Hulbert, Harvey Douglas Keith, Frank Norwood Lee, Peter Arthur Lee, Max Menachem Mordechai Lipsicas-Lipschitz, Richard Leonard Mason, Leslie Alan Mitchell, Thamotherampillai Thambyahpillai; Abdel-Moneim Awadalla, Robert Bouchez, Edward C. Bullard, Richard Henry Dalitz, Robert Hofstadter, Raghunath Parashuram Thatte, Karl Weissenberg, John William White.

The thirty-seventh (1953) Guthrie Lecture was delivered by Professor Max Born (Edinburgh University) on The conceptual situation in physics and its prospects of development.

*19th March 1953*

*The twelfth Annual General Meeting of THE OPTICAL GROUP in the Physics Department, Imperial College, London S.W.7.* Dr. A. C. Menzies was in the Chair.

The Minutes of the Eleventh Annual General Meeting were read and confirmed.

The Report of the Committee for 1952-53 was presented.

The Officers and Committee for 1953-54 were elected.

A vote of thanks was accorded to retiring Committee Members.

---

*19th March 1953*

*The fifty-eighth meeting of THE OPTICAL GROUP in the Physics Department of Imperial College, London, S.W.7.* Dr. A. C. Menzies was in the Chair.

The following papers, accompanied by demonstrations, were presented by members of the staff of the Hilger Division of Messrs. Hilger and Watts, Ltd : Spectroscopic advances, by Dr. A. C. Menzies; The design of spectrographs, by Mr. J. W. Perry; An aspect of optical design, by Mr. G. E. Fishter; Photocells and their uses, by Mr. E. Schwarz; Interference filters, by Dr. W. Zehden; Electronics applied to optical instruments, by Mr. F. Holmes.

---

*25th March 1953*

*The seventy-second Science Meeting of THE COLOUR GROUP was held in the Physics Department, Imperial College, London S.W.7.* Dr. T. Vickerstaff was in the Chair.

The following address was given by the retiring Chairman : Colour problems in the dyeing industry.

---

*26th March 1953*

*The sixth Annual General Meeting of THE ACOUSTICS GROUP in the City and Guilds College, Exhibition Road, London S.W.7.* Mr. W. West was in the Chair.

The Minutes of the fifth Annual General Meeting were read and confirmed.

The Report of the Committee for 1952-53 was presented.

Various amendments to the regulations were proposed and approved.

The Officers and Committee for 1953-54 were elected.

A vote of thanks was accorded to the retiring Committee Members.

---

*26th March 1953*

*The fifty-third meeting of THE ACOUSTICS GROUP in the City and Guilds College, London S.W.7.* Mr. W. West was in the Chair.

The following paper was read : High speed flight, by Mr. D. W. Holder.

---

*30th March-1st April 1953*

*Spring Provincial Meeting in the Department of Physics, University of Leeds.* The President, Professor R. Whiddington, was in the Chair.

The following were elected to Fellowship, the first named being transferred from Student Membership : Donald Percy Dennis Webb; Thomas Henry Bull, Roger Davis Harrison, Sydney Charles Haydon, Harry Rostrom Hindley, Urner Liddel, Alan Maxwell.

It was announced that Council had elected the following to Student Membership : Kevin Antony Brennan, David John Byers, William Alfred Delbridge, Grahame John Fraser, John Arthur Gibson, Edwin Lovell Heasell, Ian Simpson Hughes, John Richards Hulston, Peter Charles Lewis, Yung Kuo Lim, George Herbert Mycroft, Edward George Sydney Paige, John Richard Storey, John William Graydon Wignall.

The subject of the meeting was Aspects of solid state physics.

The following papers were read and discussed : Magneto-caloric effects in low and moderate fields, by L. F. Bates; Magneto-caloric effects in high fields, by W. Sucksmith; Variation of magnetization with temperature, by R. S. Tebble; Theory of variation of magnetization in high fields, by K. Hunt; Electron interactions and the magnetic and thermal properties of metals, by E. P. Wohlfarth; Electrical resistance of metals at low temperatures or electronic structure of metals, by P. Rhodes; Magnetic and thermal properties of some alloys, by F. E. Hoare; Dia- and paramagnetism of metals and alloys, by W. E. Elcock; Optical and electrical properties of some phosphors, by J. Ewles; Colour centres in alkali halides, by E. E. Schneider; Ferroelectricity in the perovskite type structures, by L. E. Cross; Theory of ferroelectrics, by A. F. Devonshire.

---

9th April 1953

*The forty-fourth Science Meeting of THE LOW TEMPERATURE GROUP* was held in the Lecture Theatre of the Science Museum, Exhibition Road, London S.W.7.

Dr. K. Mendelssohn was in the Chair.

The following paper was read : The use of liquid oxygen in rocket motors, by Mr. S. Allen.

---

13th April 1953

*A Fellows' Luncheon* took place in the Upper Dining Hall, Imperial College Union, Prince Consort Road, London S.W.7. The President, Professor R. Whiddington, was in the Chair.

---

13-17th April 1953

The following discourses were delivered during the 37th Physical Society Exhibition of Scientific Instruments and Apparatus at Imperial College, London S.W.7 : Seismic study of the ocean basins, by E. C. Bullard (*14th April*); Particles, pellicles; pigments, paints and physics, by Dr. L. A. Jordan (*15th April*); Scintillation counting and its medical applications, by Prof. W. V. Mayneord (*16th April*).

The Prizes and Certificates awarded in the Craftsmanship and Draughtsmanship Competition were presented on 13th April by Prof. R. Whiddington (President, and Chairman of the Exhibition Committee).

---

14th May 1953

*The fifty-fourth Science Meeting of THE ACOUSTICS GROUP* was held in the Physics Lecture Theatre of Imperial College, London S.W.7. Mr. W. West was in the Chair.

The following paper was read : The relation between the sone and phon scales of loudness, by Mr. D. W. Robinson.

---

15th May 1953

*Annual General Meeting* in the Large Lecture Theatre of Imperial College, London S.W.7. The President, Professor R. Whiddington, was in the Chair.

Minutes of the previous Annual General Meeting held on 20th May 1952 were read and confirmed.

The Reports of Council and the Honorary Treasurer and the Accounts and Balance Sheet for 1952 were adopted.

Scrutineers were appointed and the Officers and Council for 1953–54 were elected.

The auditors, Messrs. Knox, Cropper and Co. were re-elected.

Votes of thanks were accorded to retiring officers and members of Council, to the officers and members of the committees of the Society, and of the Society's specialist groups; to the Rector and governing body of Imperial College, and to the Heads of the various departments who have given hospitality to the Society at the Annual Exhibition; to the Manageress of the Royal Institution, the Directors of the Science Museum and the various universities at which meetings have been held; and to the Royal Commissioners for the Exhibition of 1851.

---

15th May 1953

*Extraordinary General Meeting* in the Large Lecture Theatre of Imperial College, London S.W.7. The President, Professor R. Whiddington, was in the Chair.

The following resolutions for the adoption of new Articles of Association were proposed and approved :

1. That the proposed new Articles of Association be finally approved and adopted.
  2. That the proposed new Rules of the Society be finally approved and adopted.
- 

15–16th May 1953

*Science Meeting* in the Large Lecture Theatre of Imperial College, Exhibition Road, London S.W.7. The President, Professor R. Whiddington, was in the Chair.

It was announced that Council had elected the following to Student Membership :

1st May 1953: John Michael Gibbons, Richard Frederick Anthony Keating, David Warwick Martin, Arthur Leslie Wallis.

29th May 1953: Thomas Rosslyn Barnett, Raphael Berenbaum, Leon Maissel, Norman Arthur Slark.

The following were elected to Fellowship, the first named being transferred from Student Membership :—Horace Raymond Moore ; Anton Rafael Azzopardi, Neil Brearley, Geoffrey Norman Harding, John Irving, Walter Rule Nimmo, Douglas Harvey Welch.

The meeting was a symposium on Recent research in electron optics. The following papers were read and discussed : The properties of magnetic electron lenses, by G. Leibmann; The magnetic circuit of electron lenses, by T. Mulvey; Design of a large lens for electron scattering experiments, by J. Ellis; Electron lenses with line focus, by O. Klemperer; Possibilities of correction for electrostatic lenses by abandoning rotational symmetry, by J. C. Burfoot; Astigmatism in electron lenses and measures which may be taken for its correction, by G. D. Archard; Image curvature of electron lenses, by B. J. Mayo; Electron optical properties of high voltage electron guns with hairpin tungsten filaments, by M. E. Haine and P. A. Einstein; Emission characteristics of medium and low energy electron guns, by L. Jacob; Particle orbits in the strong focusing synchrotron, by F. K. Goward; Focusing the linear proton accelerator, by J. S. Bell; The deflection of cathode-ray beams, by L. S. Allard; Time lag in scanned images and electron optics, by B. Meltzer; Electron optics in valves, by C. S. Bull; A velocity spectrograph with helical axis, by D. Gabor; Electron optics of spectrometers for absolute measurements of beta line spectra, by R. E. Siday; Axially symmetric magnetic prisms, by J. E. C. Jennings; The production of fine electron foci and their uses, by V. E. Cosslett; Fine electron foci in physics research, by W. Ehrenberg; Electron microscopical methods for direct examination of solid surfaces, by J. W. Menter; Resistor network analogue methods in electron optics, by G. Leibmann; Some prevalent misconceptions in electron optics, by P. A. Sturrock.

20th May 1953

The seventy-third Science Meeting of THE COLOUR GROUP was held at the Lighting Service Bureau, 2 Savoy Hill, London W.C.2. Dr. L. C. Thomson was in the Chair.

The following papers were read : Colour changes and the function of colour memory in the use of chemical indicators, by Dr. J. King; The complementary hues of after-images, by Mr. M. H. Wilson.

---

21st May 1953

An all-day Meeting was held jointly with the Acoustics Group and the Royal Aeronautical Society on Aeronautical acoustics—in particular jet noise—at the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London S.W.1.

The following papers were read : *Engine noise*, by Professor E. J. Richards and Mr. F. B. Greatrex (Chairman, Mr. N. Fleming); *Aircraft noise* : Aerodynamic noise, by Mr. G. M. Lilley, and noise associated with supersonic flight, by Mr. C. H. E. Warren (Chairman, Mr. W. Makinson); *Ground noise* : Air to ground noise, by Mr. N. Fleming, and Ground-to-ground noise, by Mr. J. D. Hayhurst (Chairman, Dr. G. E. Bell).

This was followed by a general discussion.

---

25th March 1953

The thirteenth Annual General Meeting of THE COLOUR GROUP in the Physics Department, Imperial College, London S.W.7. Dr. T. Vickerstaff was in the Chair.

The Minutes of the Twelfth Annual General Meeting were read and confirmed.

The Report of the Committee for 1952–53 was presented.

The Subscription Rates for overseas members were reduced.

The Subscription Rates for all members residing in Great Britain were raised.

The Officers and Committee for 1953–54 were elected.

A vote of thanks was accorded to retiring Committee Members.

---

29th May 1953

THE LOW TEMPERATURE GROUP visited the H. H. Wills Physical Laboratory, Bristol. A talk was given on the work of the Laboratory, and was followed by a tour of the Laboratory.

---

25th June 1953

THE COLOUR GROUP's Summer Meeting was held at the Dyehouse Laboratories of Imperial Chemical Industries Limited, Blackley, Manchester. The programme included a lecture, and a tour of the laboratories to see methods of applying dyes to textiles and other materials, and inspection of a variety of spectrophotometers and other apparatus used in the study of dyeing processes.

---

26–27th June 1953

The sixtieth Science Meeting of THE OPTICAL GROUP was a Summer meeting at St. John's College, Cambridge.

The following Papers and Demonstrations were given :

Papers : The theory of R.M.S. aberration balancing, by Dr. E. H. Linfoot; The measurement and interpretation of grain in quantitative photography, by Dr. P. B. Fellgett; The influence of the illuminating aperture on optical images, by Dr. H. H. Hopkins; The experimental verification of the basic theory of partial coherence, by Mr. L. F. Baker.

*Demonstrations*: High resolution spectroscopy of the sun, by Dr. E. von Klüber; A reflecting microscope in use, by Dr. K. J. Olney.

---

13-14th July 1953

*Summer Provincial Meeting* in the Department of Physics, King's College, Newcastle-upon-Tyne. The President, Professor R. Whiddington, was in the Chair.

It was announced that Council had elected the following to Student Membership : Brian Shaw Coupe, Peter J. Eccles; and the following to Fellowship, the first three being transferred from Student Membership : Arnold Brendon Clare, Bruce Sween Liley, John Alexander McDonnell; William Julian Kramers, Kurt V. H. Liden, Thomas Mathai, Harry Messel, Stephen Alan Ryce, Andre De Troyer.

The subject of the meeting was Optics and ultrasonics.

The following papers were read and discussed : Measurements with ultrasonics at low temperatures, by A. van Itterbeek; Ultrasonic absorption in some solutions and dispersions, by A. W. Pryor; Ultrasonic absorption in carbon dioxide contained in a narrow tube, by L. E. Lawley; The coefficient of bulk viscosity of fluids, by R. Roscoe; Interferometric measurements of the Lamb shift in hydrogen-like spectra, by C. W. Series; A new test for a reflecting echelon, by T. A. Littlefield; Microwave spectroscopy of the solid state, by E. E. Schneider; A double beam spectrophotometer and its use for measurements on colour centres in alkali halides, by R. V. Hesketh; The influence of configuration interaction on the theoretical values of the polarizability of helium, by J. A. Abbott and H. C. Bolton; New methods in the wave mechanics of molecules, by R. McWeeny.

---

18th-23rd July 1953

Conference (sponsored by the Electrical Research Association, The Institute of Physics and the Physical Society) at the Clarendon Laboratory, Oxford. The following took the Chair at various sessions : Dr. T. E. Allibone, Sir John Cockcroft, Dr. C. Sykes, Professor R. Whiddington and Dr. S. Whitehead.

The subject of the conference was Ionization phenomena in discharges, and papers were read under the following headings :

Sparks. (Dr. J. D. Craggs, Professor J. M. Meek, Professor L. H. Fisher, Dr. C. E. R. Bruce.)

High Power Arcs. (Professor B. J. F. Schonland, Professor R. Mannkopff, Professor Lochte-Holtgreven.)

Glow Discharges. (Dr. P. F. Little, Professor K. G. Emeléus, Dr. F. M. Penning, Professor F. Llewellyn Jones.)

High Frequency Discharges. (Dr. W. A. Prowse, Dr. G. Francis, Mr. D. C. Dalton, Professor S. C. Brown.)

Ionization Processes and the Effect of a Magnetic Field. (Mr. J. M. Somerville, Professor G. Weissler, Mr. P. J. Jutsum, Professor J. Clay, Professor G. Valle.)

Geiger Counters. (Mr. R. Loosemore, Dr. L. Colli, Dr. V. Facchini, Mr. P. J. Campion, Dr. A. den Hartog.)

Ultra High Vacua. (Mr. J. Leech, Mr. J. H. Mason, Dr. D. Alpert, Dr. R. L. Fortescue, Dr. S. Wagener.)

General discussion followed and was opened by Professor G. Geballe and Dr. M. Biondi.

---

ABSTRACTS OF SPECIAL LECTURES

**29th (1952) Duddell Medal and Address. Mr. C. Waller.**

Some Topics Concerning the Production and Application of Nuclear Emulsions.

*Abstract.* The photographic emulsion chemist owes much to pure science and, since he cannot pay his debt by considerable contributions to the literature of science, he is fortunate in that his products are tools which are used throughout almost the whole range of scientific research. The techniques whereby the photographic method has attained its present position in nuclear research are the result of the combined effort of nuclear physicist and emulsion maker, the former having made great contributions, even in chemical aspects of the work.

The chemist's part is to devise suitable emulsions that may be produced in high concentration and that will permit the application of the various processes which give it full sensitivity. Production must be possible on quite a large scale, must be reliable, and must give reasonably consistent products; stringent control and testing at all stages of manufacture are essential.

The users of nuclear emulsions, and in particular a few leading university teams, have evolved the methods by which the plates are handled and the results evaluated. Development by 'Temperature Cycle', and by the low temperature method, have secured uniformity and minimal distortion. Other stages of processing present their own problems through the need to use very thick emulsion layers.

**8th (1952) Charles Vernon Boys Prize and Address. Dr. D. Bleaney.**

Paramagnetic Resonance at Low Temperatures.

*Abstract.* When a paramagnetic solid is placed in a steady magnetic field, magnetic dipole transitions between the various energy levels may be induced by application of an alternating magnetic field of suitable frequency. Such transitions are detected by centimetre wave techniques, and used to study the behaviour of the energy levels of the ground state of a paramagnetic ion. In many cases a hyperfine structure is present, from which data concerning the nuclear spin, magnetic moment and electric quadrupole moment can be deduced.

**37th (1953) Guthrie Lecture. Professor M. Born.**

Published in *Proc. Phys. Soc. A*, 1953, **66**, 501.

**6th (1952) Rutherford Lecture. Professor R. E. Peierls.**

Published in *Proc. Phys. Soc. A*, 1953, **66**, 313.

**8th (1952) Holweck Medal, Prize and Lecture. Mr. J. A. Ratcliffe.**

Diffraction of Radio Waves by the Ionosphere.

This lecture was delivered in Paris to the French Physical Society in May 1953.



# THE PHYSICAL SOCIETY

## REPORT OF COUNCIL FOR THE YEAR ENDED 31<sup>ST</sup> DECEMBER 1952

During the past year the Council of the Physical Society has put forward suggested changes in the organization of the work of the Society.

An Extraordinary General Meeting held on 20th May 1952 agreed that new Articles of Association should be submitted to the Board of Trade for their approval. These are still under consideration by the Board of Trade.

A new scheme of subscriptions, which was approved in principle in 1951, was completed in detail and adopted at an Extraordinary General Meeting held on 3rd October 1952, and came into operation on 1st January 1953. Under this scheme subscriptions for publications are separated from the subscriptions for membership of the Society, and in addition provision has been made for the purchase of separate copies of papers published in the *Proceedings of the Physical Society*. It is hoped that this will meet the varied needs of our Fellows.

A grant from the Royal Society for the development of the Library which was received early in the year has been used mainly for cataloguing and for increasing the shelf space. A complete card index to both textbooks and periodicals is now available. A number of new books have been ordered, including a selection of books to be purchased under the terms of the Addenbrooke Bequest. Details of the additions to the Library are given in the Society's bulletins to members.

The Library has in the past been the joint responsibility of the Physical Society and the Institute of Physics. The Board of the Institute has now suggested that the Library would be better administered by the Physical Society alone; they have given to the Society their holdings of books and journals at present in the Library, and are continuing to pass on to the Library periodicals received in exchange for the Institute journals. The Council of the Physical Society takes this opportunity of expressing its appreciation to the Board for this most generous gesture.

The Council of the Physical Society wishes to record the cordial thanks of the Society to the various bodies who provided hospitality for the Science Meetings of the Society and its four Groups, and to the Rector and Governing Body of Imperial College and the Heads of the Physics, Chemistry and Mathematics Departments for the privilege of holding the Annual Exhibition in these sections of the College.

### MEETINGS

The Annual General Meeting was held at the Royal Institution on 20th May 1952. Reports of the Council and of the Honorary Treasurer and the Annual Accounts for 1951 were adopted.

Professor R. Whiddington, C.B.E., M.A., D.Sc., F.R.S., was elected President and the Officers and Council for 1952–53 were elected. The Presidential Address was delivered by the retiring President, Professor L. F. Bates, Ph.D., D.Sc., F.R.S.

Meetings out of London were held at the H. H. Wills Physical Laboratories, Bristol University, on 24th and 25th March, at the University of Glasgow on 10th and 11th July, and at the Physical Laboratories, Manchester University, on 18th and 19th December.

Eight Science Meetings were held in London during the year. This year, for the first time, the Society published a sessional list of meetings of the Society and its Specialist Groups, and a sessional list of meetings of the Institute of Physics, in accordance with the arrangements with the Institute reported last year.

## MEMORIAL LECTURES AND AWARDS

The 36th GUTHRIE LECTURE was delivered by Sir Lawrence Bragg on "X-Ray Analysis of Proteins" at the Royal Institution on 12th March 1952.

The 7th HOLWECK MEDAL of the Société Française de Physique and the HOLWECK PRIZE of the Physical Society were presented to Professor L. Néel at the Royal Institution on 27th May 1952. The Holweck Discourse delivered by Professor Néel was entitled "Antiferromagnétisme et Ferrimagnétisme".

The 6th RUTHERFORD LECTURE was delivered by Professor R. E. Peierls on "The Atomic Nucleus and Its Constituents" at the Science Museum on 3rd October 1952.

The 29th DUDDELL MEDAL was presented to Mr. C. Waller, who gave a talk on "Some Topics concerning the Production and Application of Nuclear Emulsions", and the 8th CHARLES VERNON BOYS PRIZE was presented to Dr. B. Bleaney, who gave a talk on "Paramagnetic Resonance at Low Temperatures". The presentations were made at the Science Museum on 28th November 1952.

## EXHIBITION OF SCIENTIFIC INSTRUMENTS AND APPARATUS

The 36th Exhibition was held at Imperial College from 3rd-8th April 1952, and was housed in the Physics and Chemistry Departments in the Main Building and in the Mathematics Department in the Huxley Building. The attendance showed a slight increase over that of the previous year, reaching 13,000, excluding members and exhibitors. The Society was again fortunate in having Mr. A. G. Peacock as Honorary Exhibition Secretary, and is greatly indebted to him for his valuable service in this capacity.

The Craftsmanship and Draughtsmanship Competition was held in March, and entries were displayed at the Exhibition. By courtesy of the Director of the Science Museum winning entries were displayed for a further period in the Science Museum. The total number of entries was 85, and 34 prizes and 50 certificates were awarded, including the 'Silvanus P. Thompson Prize'. The Council records its appreciation of a donation of £50 by the Scientific Instrument Manufacturers' Association from the Bowen Trust Fund. This was applied to the first prizes in four of the classes in the Competition, these prizes being designated 'Bowen Prizes'.

## PUBLICATIONS

### *Proceedings*

The valuable service of our referees is again apparent in the statistics for the *Proceedings*: we have achieved a further slight reduction in the average length of papers, and the overall size of the *Proceedings* is somewhat less than in 1951 although the total number of papers published is slightly greater. The average time of publication has improved from 5½ months in 1951 to a little under 5 months in 1952. It is hoped that a further improvement may be possible in the coming year as a result of slight modifications which are to be introduced in the style of printing.

The distribution of papers between Sections A and B is almost equal (113 in A, 117 in B) but Letters to the Editor have numbered 83 in A against 45 in B.

Of 295 papers and 141 letters submitted for publication during the year approximately 70 were returned to authors as unsuitable for publication.

### *Reports on Progress in Physics*

Volume 15, published in the spring of 1952, contains reports on nine subjects in various branches of physics. This Volume contains a cumulative index of authors and contents covering Volumes 1-15. Copies of this cumulative index are also available separately.

The Volume for 1953 will be published during the spring and will again contain nine reports.

A comprehensive cumulative subject index for Volumes 1-10 has been prepared by Mr. M. E. J. Gheury de Bray and will be published during the summer of 1953,

## MEMBERSHIP

Roll of Membership		Hon. Fellows	Ex- officio Fellows	Fellows	Student Members	Total
Totals, 31st Dec. 1951		7	4	1647	367	2025
Changed during 1952	Newly elected	2		74	83	
	Re-elected			2	2	
	Transferred			46	46	
	Deceased			11		
	Resigned			52	20	
	Lapsed			2	66	
Net increase		2		57	17	76
Totals, 31st Dec. 1952		9	4	1704	384	2101

The following is a summary of the membership during the past eight years :

Year . . . . .	1945	1946	1947	1948	1949	1950	1951	1952
Newly elected Student Members	68	53	102	126	77	103	117	83
Transfers from Student Member- ship . . . . .	52	46	33	39	50	52	69	46
Newly elected Fellows . . . .	56	139	126	87	71	65	98	76
Net increase in Fellowship . . .	80	165	137	60	48	21	83	57
Net increase in total Membership	75	160	179	120	39	40	89	76

## GROUPS

## COLOUR GROUP

The twelfth Annual General Meeting of the Colour Group was held on Wednesday, 26th March 1952, in the Lecture Room of the Royal Photographic Society. Dr. T. Vickerstaff was re-elected Chairman and Mr. R. W. G. Hunt was elected Honorary Secretary.

Six Science Meetings were held during the year. A summer visit to Cambridge was held on 16th July 1952, and the thanks of the Group were due to Dr. E. N. Wilmer and to Messrs. Pye Limited for making the arrangements. The report of the Sub-Committee on Colour Systems is nearing completion. At the 1952 Exhibition of Scientific Instruments held by the Physical Society the Group provided an exhibit entitled "The Production of Colour by Physical Means".

## OPTICAL GROUP

The eleventh Annual General Meeting of the Optical Group was held on Thursday, 20th March 1952, in the Physics Department of Imperial College. Dr. A. C. G. Menzies was re-elected as Chairman and Mr. K. J. Habell was re-elected as Honorary Secretary.

Seven Science Meetings were held during 1952.

## LOW TEMPERATURE GROUP

The seventh Annual General Meeting of the Low Temperature Group was held on Thursday, 4th December 1952, in the Lecture Theatre of the Science Museum. Professor D. M. Newitt was re-elected Chairman, Mr. C. M. Brain was elected Vice-Chairman and Dr. F. Din was elected Honorary Secretary.

Six Science Meetings were held during the year. A meeting was also held on the subject "Some Effects of Low Temperatures on Biological Systems" which was introduced by Dr. J. C. Fidler. The second overseas meeting was early in November, when a party of 24 members visited laboratories and industrial plants in Holland.

**ACOUSTICS GROUP**

The fifth Annual General Meeting of the Acoustics Group was held on Thursday, 24th April 1952, in the Henry Jarvis Hall of the Royal Institute of British Architects. Mr. W. West was elected Chairman, Mr. L. C. Pocock was re-elected Vice-Chairman and Mr. A. T. Pickles was elected Vice-Chairman; Mr. W. A. Allen was re-elected Honorary Secretary and Dr. R. W. B. Stephens was elected Honorary Secretary.

Seven Science Meetings were held during the year. Mr. W. West, the Chairman of the Group, continues to be the British Representative on the International Commission on Acoustics, and he also represents the Physical Society on the B.S.I. Acoustics Standards Committee. Mr. G. Bradfield and Dr. E. G. Richardson have been elected Chairman of two sections of the International Meeting on Electro-Acoustics to be held in Holland in June 1953.

**MEMBERSHIP**

The membership of the four Groups on 31st December 1952 was as follows :

	Colour	Optical	Low Temperature	Acoustics
Members of the Physical Society	123	199	67	97
Members of participating bodies	70	62	45	144
Members of firms subscribing for sustaining membership . . .	20	57	—	—
<i>Ex-officio</i> members . . . .	—	—	—	2
Other members . . . . .	26	18	18	43
	—	—	—	—
	239	336	130	286
	—	—	—	—

The following is a summary of the membership of the four Groups during the past eight years :

	1945	1946	1947	1948	1949	1950	1951	1952
Colour Group . . . .	178	208	210	223	232	216	219	239
Optical Group . . . .	326	381	286	363	356	326	315	336
Low Temperature Group .	54	85	88	90	94	118	124	130
Acoustics Group . . . .	—	—	205	265	277	291	260	286

**OBITUARY**

The Council records with great regret the deaths of the following Fellows : Mr. D. K. Ashpole, Mr. L. Bellingham, Sir William Dampier†, Mr. M. Finn, Mr. E. F. Herroun†, Mr. K. G. Hinton, Professor C. H. Lees\*, Mr. W. Lethersich, Dr. S. R. Lewis, Professor F. H. Newman, Mr. G. H. Wingate.

\* Member of Council 1910–14, President of the Physical Society 1918–20.  
† Life Fellows.

**REPRESENTATION ON OTHER BODIES**

The Society was represented on various committees as follows :

*Board of the Institute of Physics* : Dr. A. B. Wood, Dr. C. G. Wynne.

*British Committee for Radiological Units* : Sir John Cockcroft, Professor H. T. Flint, Mr. D. W. Fry, Mr. W. G. Marley, Professor E. A. Owen.

*British Journal of Applied Physics Advisory Committee* : Dr. A. G. Gaydon, Dr. W. S. Stiles.

*British Standards Institution—Acoustics Standards Committee* : Mr. W. West.

*British Standards Institution—Colour Terminology Committee* : Mr. J. G. Holmes, Professor W. D. Wright.

*British Standards Institution—Committee on Electrical Nomenclature and Symbols* : Dr. L. Hartshorn.

*British Standards Institution—Committee on Units and Technical Data* : Professor H. T. Flint.

*British Standards Institution—Sub-Committee on Temperature Measurement* : Dr. E. Griffiths.

*British Standards Institution—Technical Committee on Optical Instruments* : Dr. C. G. Wynne.

*British Standards Institution—Units and Symbols Standards Committee* : Mr. J. H. Awbery.

*British Standards Institution—Technical Committee USM/2 Units, Symbols and Abbreviations* : Dr. A. C. Stickland.

*Chemical Society—Infra-Red Committee* : Dr. A. C. G. Menzies.

*Faraday Society—Colloid and Biophysics Committee* : Professor J. T. Randall.

*Geophysical Committee of the Royal Astronomical Society* : Dr. J. McG. Bruckshaw.

*Joint International Committee on Psychrometric Data* : Professor P. A. Sheppard.

*Journal of Scientific Instruments Advisory Committee* : Mr. T. C. Keeley, Dr. C. G. Wynne.

*London Regional Advisory Committee—Applied Physics* : Dr. R. W. B. Stephens.

*Ministry of Health—Radioactive Substances Advisory Committee* : Sir George Thomson.

*Ministry of Labour and National Service Committee* : The President of the Physical Society.

*Royal Society British National Committee for Theoretical and Applied Mechanics* : Professor O. A. Saunders.

*Royal Society Committee on Symbols* : Mr. J. H. Awbery, Professor H. T. Flint.

*Royal Society National Committee for Crystallography* : Dr. H. Wilman.

*Royal Society National Committee for Physics* : Professor L. F. Bates, Dr. A. C. G. Menzies, Dr. D. Roaf.

*Royal Society National Committee for Scientific Radio* : Dr. W. J. G. Beynon, Dr. A. C. B. Lovell.

*Royal Society Paul Instrument Fund* : Professor R. V. Jones.

*Royal Society Scientific Accommodation Committee* : The President of the Physical Society.

*Science Abstracts Committee of Management* : Mr. J. H. Awbery, Dr. A. G. Gaydon, Dr. E. P. George, Dr. D. Roaf.

The Council appreciates the valuable work done by these representatives.

---

## TREASURER'S REPORT ON THE ACCOUNTS OF THE PHYSICAL SOCIETY FOR THE YEAR ENDING

### 31ST DECEMBER 1952

#### INCOME AND EXPENDITURE ACCOUNT

It is not very profitable to make any detailed comments on the Income and Expenditure account for the year 1952 since, as Fellows will be aware, the finances of the Society will have a markedly different structure during the year 1953, and, in consequence, any review of the past year's accounts, and any lessons to be learned from that review, can have little direct impact on the finances of the Society during the present year. Nevertheless, it is fitting that the Treasurer should give an account of his stewardship during the past year. Certain difficulties in connection with the finances of the Physical Society have been brought to the attention of Fellows at the last two or three Annual General Meetings and consideration of these difficulties has led to the evolution of a new financial framework for the Society. In spite of the fact that during the past year a balance of income over expenditure of approximately £2,500 has been achieved, indications can still be found in the accounts now being considered of certain tendencies to instability in the finances of the Society which, it is hoped, will be removed by the new system which has been adopted.

*Membership Expenditure*

The total income from subscriptions at January 1953 was £5,231 and, once again, this amount has not been sufficient to cover the cost, £5,799, of providing the membership with the normal amenities and privileges. However, the cost of *Science Abstracts*, £2,569, appears as an expense of this magnitude for the last time and the Society should in the future feel able, if it be deemed necessary, to extend the amenities given to its Fellows.

*Groups Expenditure*

Some comment was made in last year's report on the smallness of the income as compared with expenditure of the Groups. Since that time a most helpful meeting has been held with the Officers of the Groups, and it is only fair to say here that the situation was perhaps not quite so bad as the bald financial facts appeared to indicate. The Groups' activities are very vital to the welfare of the Society and justify considerable expense. The closer liaison which has been established between the Finance Committee of the Society and those responsible for the finances of the Groups should ensure that this expense does not become too considerable.

*Publications*

It will be noticed that the cost of the Society's publications is just about balanced by the income from sales and publications, with the addition of the generous grant from the Royal Society. It is gratifying to notice that there has been a substantial increase in the sales of the *Proceedings* during the past year and it is hoped that further increases will take place in the future.

*Library*

The acquisition of a large Council chamber at the Society's Headquarters provided the opportunity for extending the Library facilities of the Society. Consequently, the expenditure under this heading has been much greater than usual, but a large proportion of this expenditure has been met by a grant from the Royal Society. The Council has felt that if the Society has a Library at all it should be a worthy one and, if circumstances permit, the policy of building up the Society's Library will continue.

*Exhibition*

The Society has benefited to the extent of £4,000 in consequence of the 1952 Exhibition. This very favourable result has not only covered the losses on the membership, Groups and Library expenditures, but has enabled the Society to finish the year with a balance of income over expenditure of £2,573. Providing the annual Exhibition continues its successful career and providing the change in policy in regard to members' subscriptions and publications produces the favourable financial results expected, the Society should be able, in the immediate future, both to undertake once again certain activities which it has been compelled to forgo and to achieve greater financial stability by the building up of reasonable reserves.

**BALANCE SHEET**

The total assets of the Society at 31st December 1952 amount to £36,977. The investments are shown at cost (1939 value) at £12,941; the market value of these at the end of 1952 was estimated to be £11,869. Of the value of these investments £3,815 relates to the Special Funds.

**GENERAL**

It is a happy circumstance that the accounts for 1952, being the last based on the subscription system, which has been in force for many years, indicate a relatively favourable financial situation and that the old system has not departed in disgrace. Nevertheless, the reasons for making the changes which have been made were and are very cogent ones and, whilst the changes have been made in some measure as an act of faith, yet the indications are that the Society may well be freed from acute financial anxiety in the immediate years which lie ahead.

A. J. PHILPOT,  
*Honorary Treasurer.*

**DETAILS OF SPECIAL FUNDS, 31ST DECEMBER 1952**

	As at 31/12/51			As at 31/12/52			Capital Transferred to General Fund.		
	Capital			Revenue					
	£	s.	d.	£	s.	d.			
W. F. Stanley Trust Fund	..	..	..	374	0	0	14	0	0
Duddell Memorial Trust Fund	..	..	..	1,866	10	0	5	1	10
Charles Chree Medal and Prize Fund	..	..	..	900	0	0	Def. 11	3	5
Charles Vernon Boys' Prize Fund	..	..	..	250	0	0	-	-	-
Holweck Prize Fund	..	..	..	337	0	0	55	1	0
Addenbrooke Bequest	..	..	..	188	2	4	2	13	8
Silvanus P. Thompson Memorial Fund	..	..	..	£4,174	12	4	£66	10	2
				£259	0	0	£251	1	10
							£284	7	8
							<u>£3,815</u>	<u>12</u>	<u>4</u>
							<u>3</u>	<u>14</u>	<u>10</u>
							<u>£142</u>	<u>16</u>	<u>4</u>

\* Grant from Physical Society General Fund.

## INCOME AND EXPENDITURE ACCOUNT

<i>Year to 31/12/51</i>	<i>EXPENDITURE</i>	<i>£</i>	<i>£</i>
2,520	To MEMBERSHIP EXPENDITURE :		
	" Science Abstracts " .. ..	2,569	
580	Agenda Papers, Notices and Expenses		
53	of Meetings .. ..	504	
53	Honoria to Special Lecturers .. ..	58	
1,390	Audit and Accountancy Fee .. ..	53	
601	Salaries .. .. ..	1,456	
209	Office Expenses .. .. ..	734	
	Postage .. .. ..	425	
5,406			5,799
1,010	,, GROUPS EXPENDITURE :		
408	Agenda Papers, Notices and Expenses		
397	of Meetings, etc. .. .. ..	233	
131	Salaries .. .. ..	416	
74	Office Expenses .. .. ..	160	
	Postage .. .. ..	73	
26,153			882
6,800	,, PUBLICATIONS :		
8,000	Stock, 1st January 1952 .. ..	6,800	
10,011	" Proceedings " .. ..	11,467	
3,055	" Reports on Progress in Physics " ..	2,624	
115	Special Publications .. .. ..	122	
2,979	Salaries .. .. ..	2,872	
980	Office Expenses .. .. ..	1,112	
1,013	Postage .. .. ..	770	
26,153			25,767
6,800	Less: Stock 31st December 1952 ..		7,100
19,353			18,667
3,806	,, EXHIBITION :		
794	Expenses .. .. ..	4,173	
261	Salaries .. .. ..	833	
25	Office Expenses .. .. ..	319	
	Postage .. .. ..	108	
4,886			5,433
213	,, LIBRARY EXPENDITURE :		
	Expansion .. .. ..	492	
	Periodicals and Books .. ..	400	
	Less : Sales thereof ..	158	
		—	242
	Salaries .. .. ..	250	
	Office Expenses .. .. ..	83	
45	,, GRANTS :		1,067
	Holweck Trust .. .. ..		126
163	,, Balance, being excess of Income over		
	Expenditure, carried to General Fund		2,573
£31,076			£34,547

## THE YEAR ENDED 31ST DECEMBER 1952

<i>Year to 31/12/51</i>	<i>INCOME</i>	<i>£</i>	<i>£</i>
	By MEMBERS' SUBSCRIPTIONS :		
99	Entrance Fees .. . . .	81	
4,820	Fellows .. . . .	4,910	
256	Student Members .. . .	240	
<u>5,175</u>			<u>5,231</u>
	,, GROUP SUBSCRIPTIONS :		
33	Colour Group .. . .	36	
100	Optical Group .. . .	109	
39	Low Temperature Group .. . .	64	
117	Acoustics Group .. . .	114	
<u>289</u>			<u>323</u>
	,, PUBLICATIONS :		
	“Proceedings” :		
200	Volume for preceding year ..	193	
9,469	Volume for current year ..	10,435	
1,401	Reprints and Sundry Parts ..	1,129	
<u>11,070</u>		<u>11,757</u>	
3,574	“Reports on Progress in Physics” ..	3,744	
734	Advertisement in “Proceedings” ..	484	
559	Special Publications .. . .	519	
<u>15,937</u>			<u>16,504</u>
	,, EXHIBITION :		
7,362	Receipts .. . . .		9,464
	,, GRANTS FROM ROYAL SOCIETY :		
2,000	Publications Grant in respect of 1952 ..	2,000	
	Library Grant for expansion in respect of 1952 .. . .	500	
<u>2,000</u>			<u>2,500</u>
	,, GRANTS FROM OTHER BODIES :		
303	London Conference—Optical Group ..	59	
	,, Interest on Investments .. . .		435
10	Transfer from Life Membership Fund of amounts paid by Fellows now deceased .. . . .		31
<u>£31,076</u>			<u>£34,547</u>

## BALANCE SHEET AS

1951	LIABILITIES		
£		£	£
16,443	GENERAL FUND :		
	As on 31st December 1951 .. .	16,606	
	Add : Transfer-W. F. Stanley Trust Fund ..	259	
163	Add : Balance of Income and Expenditure Account .. .	2,573	
16,606			19,438
2,631	APPEAL FUND :		
759	As on 31st December 1951 .. .	3,390	
	Add : Further Contributions received and due ..	1,498	
3,390			4,888
2,340	LIFE COMPOSITIONS :		
10	As on 31st December 1951 .. .	2,330	
	Less: Transfer to Income and Expenditure Account .. .	31	
2,330			2,299
259	SPECIAL FUNDS :		
389	W. F. Stanley Trust Fund .. .	—	
1,871	Duddell Memorial Trust Fund .. .	385	
889	Charles Chree Medal and Prize Fund .. .	1,940	
250	Charles Vernon Boys Prize Fund .. .	889	
392	Holweck Prize Fund .. .	150	
191	Addenbrooke Bequest .. .	402	
	Silvanus P. Thompson Memorial Fund .. .	192	
4,241			3,958
102	SUBSCRIPTIONS IN ADVANCE :		
2,742	Members .. .	1,542	
	Publications .. .	3,601	
2,844			5,143
2,908	SUNDRY CREDITORS .. .	—	1,251

(Signed) R. WHIDDINGTON } Members of Council.  
C. G. WYNNE }

## REPORT OF THE AUDITORS TO THE MEMBERS OF THE PHYSICAL SOCIETY

We have obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purposes of our audit. In our opinion proper books of account have been kept by the Society so far as appears from our examination of those books. We have examined the above Balance Sheet and annexed Income and Expenditure Account, which are in agreement with the books of account. In our opinion and to the best of our information and according to the explanations given us the said accounts give the information required by the Companies Act, 1948, in the manner so required, and the Balance Sheet gives a true and fair view of the state of the Society's affairs as at 31st December 1952, and the Income and Expenditure Account gives a true and fair view of the excess of income over expenditure for the year ended on that date.

Spencer House, South Place,  
London, E.C.2.  
10th February 1953.

KNOX, CROPPER & CO.,  
Chartered Accountants.

£32,319

£36,977

DECEMBER 1952

1951	ASSETS				
£					£
	<i>Quoted Investments:</i>				
	GENERAL FUND :				
1,438	£2,100 2½% Consols	..	..	1,438	
1,636	£1,750 3½% War Stock	..	..	1,636	
2,625	£2,725 3% Defence Bonds	..	..	2,725	
535	£500 4% Funding Stock	..	..	535	
	£2,468 0s. 4d. 3% British Transport Stock 1977/88	..	..	1,792	
1,533	£1,000 3½% Defence Bonds	..	..	1,000	
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
7,767					9,126
	<i>Special Funds:</i>				
	W. F. STANLEY TRUST FUND :				
259	£338 19s. 1d. 3% British Transport Stock 1977/88	..	..	—	
	DUDDELL MEMORIAL TRUST FUND :				
374	£400 3½% War Stock	..	..	374	
	CHARLES CHREE MEDAL AND PRIZE FUND:				
	£784 4% Funding Stock	..	839		
	£1,500 2½% Consols	..	1,027		
1,866				1,866	
	CHARLES VERNON BOYS PRIZE FUND :				
900	£1,132 16s. 10d. 2½% Consols	..	..	900	
	HOLWECK PRIZE FUND :				
250	£150 3% Defence Bonds	..	..	150	
	ADDENBROOKE BEQUEST :				
337	£384 6s. 7d. 2½% Consols	..	..	337	
	SILVANUS P. THOMPSON MEMORIAL FUND :				
	£55 3% Defence Bonds	..	55		
	£133 2s. 4d. 3½% War Stock	..	133		
188				188	
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
4,174				3,815	
53	Cash at Bank: Current Account	..	..	143	
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
4,227					3,958
	(Investments, 31st December 1952— Cost or 1939 value £12,941—Market value £11,869.)				
62	Dividends due on Investments	..	..	80	
51	Inland Revenue—Income Tax recoverable			577	
143	Subscriptions due	..	..	176	
1,934	Sundry Debtors—Publications etc.	..	..	1,711	
—	Payments in advance	..		168	
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
2,190					1,879
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
3,704	Stocks—Paper at Cost	..	..	2,262	
6,800	Publications as valued by Secretary			7,100	
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
10,504					9,362
	Cash at Bank:				
1,465	Current Account, Westminster Bank Ltd.			4,607	
5,000	Deposit Account, Westminster Bank Ltd.			5,000	
1,126	Deposit Account, Post Office Savings Bank			1,665	
—	Deposit Account, Trustee Savings Bank			504	
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
7,591					11,776
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
40	Cash in Hand	..	..	..	43
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
£32,319					£36,977
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>

*Printed by Taylor & Francis, Ltd., Red Lion Court, Fleet Street, London, E.C.4*